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COST ACCOUNTANTS & INDUSTRIAL ENGINEERS

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EDITORIAL

The New Menace

The treacherous entry of Japan into the War has done one thing which should prove of value to our war effort, it has awakened many people to the fact that we are confronted with a very serious situation and that we can no longer look at the war from afar.

That in itself should be a comfort to many of us because it has long been felt that, as a people we have been too removed from any actual hostilities and that "It could not happen here." Now we know and we know further that we are up against a combination of powers that will stop at nothing and that we ourselves are in grave danger.

We should now be certain, if we were not before that the present situation means harder work and more sacrifices and we should be prepared to make them.

Not one single person should be exempt from doing his or her share either by entry into the forces of the country or by loaning every dime we can possibly loan to the country. We don't mean every dime we can spare because the word spare is purely relative.

Further we must so organize ourselves and our resources that waste will be cut down to an absolute minimum.

We must all, every one of us, be prepared to work longer hours, to produce more and to lend more than hitherto. "Let George do it" must be a slogan of the distant past and those who will not voluntarily do their share must be compelled to do it. Canada can have no place for shirkers now or at any other time.

Accountants and the War

The Dominion Government requires more and more Accountants and Cost Accountants and officials are at their wits end to find competent men.

The claim has been made that salaries offered are none too high when one takes into consideration that men appointed have, in most cases, to move their homes and expect to be released after the war when positions will be scarce. This is very true and men in secure positions, built up over a long period of years rather demure at the idea of moving their homes to take up government positions which are of the wartime variety at little more than their present remuneration.

Such men are in a far different position to younger men eligible for military service.

A suggestion has been made that the government should attempt to second from industry and commerce needed men who can be temporarily

spared from their positions and that men thus seconded for government duty in wartime should be guaranteed, so far as is possible, that their positions would be available when the war ends.

This is not easy because we do not know what the situation will be when the war ends.

We do know however that Accountants and Cost Accountants of real experience are badly needed and this suggestion seems to us to have considerable merit.

The Canadian Society of Cost Accountants and Industrial Engineers is doing valuable work through its Student Sections and its regular meetings in training men for better positions. This is naturally a slow process for you cannot take a man and make an Accountant or Cost Accountant of him in a few weeks.

It is, however, up to all men in the Accounting field to prepare themselves. It may even be that such men will be conscripted for governmental work sometime in the future.

Across the Secretary's Desk

Recently this office has received quite a number of complimentary and interesting letters regarding the certificates issued by the Ontario Society in connection with degrees. In all cases Registered Members stress their appreciation, not only of the layout and design of the Certificate but also of the culmination of the long drawn out efforts which resulted in finally securing the necessary legislation. In almost every case Registered Members who have written voice their belief that such legislation will result in vastly increased membership.

This is being borne out by actual facts because never were applications for membership so numerous. Many of these applications are from student members who desire to write our examinations and in this connection we are doing very valuable work. A Student Section was recently organized in connection with the Ottawa Chapter and by the way this Ottawa chapter, the baby of the Society, is going ahead very nicely. Other chapters who have a notion to win the Fernie Trophy this year had better look to their laurels. Right now the race is really between Ottawa, Kitchener and Windsor chapters.

Late in November I paid a visit to Montreal where I attempted to do some work in connection with increasing the membership of the Montreal chapter. I made some very valuable contacts which will result in quite a few memberships. In fact some have already applied but what pleased me most was the reception accorded me by those interviewed in regard to membership. In almost every case there was real interest shown and an appreciation of the work being done by our Montreal chapter. I was privileged to attend a directors meeting and also a regular meeting of the chapter and to renew many old friendships and also to make many new ones. Those of you who are not privileged to get around as much as I do can have no real conception of the extent and value of our work.

Now, as I look at the calendar I notice that Christmas is very close. By the time these lines are read Christmas will be passed but may I, on behalf of the officers, directors and myself wish every member and subscriber a Happy and Prosperous New Year and also that, by the time next New Year rolls around, the trying times through which the world is passing will be a memory only.

R.D.

Chapter Notes

Montreal Chapter.

The November 28th meeting of the chapter, held at the McGill Faculty club was another pronounced success. Mr. Belanger, Jr., addressed the members present prior to the main talk of the evening on Industrial Legislation and was extremely interesting. These talks are of great benefit to our members and should be copied by other chapters. The main speaker of the evening was L. A. Tucker, C.A., F.C.I.S., Comptroller and Secretary-Treasurer of the St. Lawrence Corporation who addressed the members on the subject, "The Secretary and Business Management". He was introduced by Eddie Loiselle and gave a thoroughly practical talk on a subject which created real interest with a very interesting discussion period at the close.

Toronto Chapter.

The Toronto members were guests of the Hamilton members at a Joint Meeting held at the Royal Connaught Hotel on December 10th, and the forty or more men who journeyed to Hamilton had a grand time. About one hundred sat down to dinner and later listened with real interest to a talk by Mr. J. A. D. McCurdy, Supervisor of Aircraft Purchases, Dept. of Munitions and Supply, Ottawa on the subject, "The History and Development of Aviation in Canada." Mr. McCurdy proved to be one of the best speakers heard for some time and the talk was enjoyed by every member present.

Hamilton Chapter.

About fifty members attended the dinner and about sixty-five were present at the late November meeting of the Hamilton chapter at the Royal Connaught Hotel when R. R. Evans, K.C. addressed the chapter on "Industrial Disputes Legislation." Mr. Evans proved to be a witty speaker with a thorough knowledge of his subject and the evening was one of the most enjoyable of the season.

The Joint Metting between Hamilton and Toronto chapters, held on December 10th, proved to be a meeting of exceptional merit. This meeting has already been referred to under Toronto chapter notes but it is hoped to secure a copy of Mr. McCurdy's talk for publication later in "Cost and Management."

Niagara Chapter.

The November meeting of the chapter although sparsely attended was nevertheless a really enjoyable affair and those who passed it up missed something of real value. The speaker was A. J. Mouncey of Hamilton who deputized for Mr. H. M. Hetherington who is ill. Mr. Mouncey gave a thoroughly practical talk which was much enjoyed by those present. Mr. J.

Henderson of Galt will address the December meeting on "The Education of New Employees from a Time Study Basis." Date: December 16.

Kitchener Chapter.

The November meeting of the chapter was well attended and those who did attend were well rewarded. The meeting was a discussion meeting led by Mr. W. Schaffer, Personnel Manager of the B. F. Goodrich Co. Ltd., who spoke on "Time Study Work." The discussion period was quite long and unusually interesting. Harvey W. Spry of Toronto will address the December meeting on "Control Through the Use of Forms" on December 18.

Ottawa Chapter.

The November meeting of the Ottawa chapter, while not quite so well attended as usual, was probably as good as any yet held by the chapter. The speaker was Mr. F. H. Korff of the firm of Stevenson & Kellogg Ltd., Montreal who gave a most delightful talk on "Production Problems and Their Effects Upon Costs." Mr. Korff proved a really excellent and witty speaker and those present voted it the best meeting of the season. For the December meeting to be held at the Laurentian Club on Monday, December 15, Mr. R. H. Neilson, Secretary of the National War Labour Board will be the speaker and will discuss the regulations of his Department, as they affect industry.

New Members

Montreal Chapter.

Maurice Chartrand, Mount Royal Hotel, Montreal.
George Spence, Montreal.
George Huppert, Sydney, Australia.
C. A. Girardin, Chas. Gurd & Co. Ltd., Montreal.
E. D. Tooth, Fry-Cadbury Ltd., Montreal.
C. C. Campbell, W. Clark Ltd., Montreal.

Toronto Chapter.

J. L. Brittain, Massey-Harris Co. Ltd., Toronto.

Hamilton Chapter.

W. W. Johnson, Firestone Tire & Rubber Co., Ltd.
W. R. Allen, Firestone Tire & Rubber Co. Ltd.
C. S. Hyslop, Western Life Assurance Co.

Kitchener Chapter.

R. Harrison, Can. General Rubber Ltd., Galt.
C. Packard, Can. General Rubber Ltd., Galt.
L. Lewin, Can. General Rubber Ltd., Galt.
J. G. Ramsay, Newlands & Co. Ltd., Galt.

London Chapter.

L. M. Dalgleish, London Life Insurance Co., London.
F. W. Burch, Gorman, Eckert Co. Ltd., London.

Ottawa Chapter.

J. B. Daugherty, The Jas. McLaren Co. Ltd., Buckingham, Que.
J. H. Tyner, Army Records, Dept. of National Defence, Ottawa.
S. H. Pettit, Treasury Cost. Section, Dept. of Munitions and Supply, Ottawa.

Non-Resident.

Robert Stark, Dome Mines Ltd., South Porcupine, Ont.

Literature Received

Accounting for Air Transportation.
N.A.C.A., Nov. 15.
Of interest chiefly to those engaged in this line of business but should also prove interesting to any Accountant who is interested in the application of accounting problems to varied situations.

Accounting Problems Under Priority Regulations.
N.A.C.A., Dec. 1.
An article of real interest in these strenuous days.

Establishing Relative Burden Rates on a Machine Hour Basis.
N.A.C.A., Dec. 1.
A most timely article and is a good illustration of how methods of burden application can be changed to bring cost figures into agreement with manufacturing methods.

Accounting for Nonferrous Metal Mine Development.
N.Y. C.P.A., Nov.
A complete and most interesting article of real interest to those engaged in this or similar industries.

Machine Accounting for Collateral Accounts Receivable.
N.Y. C.P.A., Nov.
Another complete and interesting article showing forms to be used.

Price and Wage Ceilings — Why?
Can. Chartered Accountant, Dec.
A very interesting and informative article of the reasons for recent legislation along these lines.

Cost Accounting in the Steel Fabricating Industry

A Thesis Submitted in Connection with the Society's Examinations

By J. A. FINLAY

Before endeavouring to outline a Cost Accounting System for an industry engaged in Steel Fabrication and Construction, it might be well worth while to look back for a few moments and realize the extent of the widely diversified classes of work which may fall into the hands of an industry of this type.

As you may imagine, this industry is entirely an engineering, fabrication and construction proposition. A few examples of the nature of the work falling within the scope of its activities are as follows: the fabrication and erection of the steel framework for a new factory building, a hotel or a hospital; the steel superstructure for a canal, a boat-dock or a bridge; the construction of such specialized classes of modern factory equipment as overhead cranes, boilers, etc.; the steel shell for a blast furnace, bodies for our armoured trucks and tanks, and even the construction of our newest

ships of war. Such examples just given do not, by any means, comprise the whole of its activities, but merely serve to indicate the extent of the work carried on.

Another point worth mentioning in looking at work in process as compared with an industry manufacturing a staple article for sale on a competitive market, is the length of time in which an order is in process. It is a common occurrence for one job to be in process for as long as three or four months, and itself utilizing the greater portion of man power and materials available. On the other hand, revenue for succeeding months may be derived entirely from hundreds of small orders which do not require longer than two or three days for completion. As a result, the customer's invoice register will be made up of charges for as little as $10.00 to as much as several million dollars.

We must also consider the relationship between the Steel Fabricator, and the finished product which, let us say, takes the form of a tall office building in the centre of the city. In the majority of such cases, the Steel Fabricator merely acts as a sub-contractor for the construction company, who is responsible for the completion of the building, and to whom the Steel Fabricator looks for payment for his services. In other cases, such as some of our newer factory buildings which are composed principally of the steel framework with brick and glass sides and sheet metal roof, he may act as general contractor, and sub-let a portion of this specialized work to an enterprise which is better equipped to handle these details. In this latter case, he would, of course, receive payment for the completed building, and reimburse the sub-contractors out of his remittance.

The first step, then, in any project, is the planning or designing of the structure, and the Steel Fabricator determining his position as the general or sub-contractor. The architect will forward his designs of the structure to several contractors who may be interested in bidding on the project and the contractor will, in turn, prepare estimates on the work he intends to do himself. He will then call for outside bids for the specialized work on the job which he intends to sub-let, and the price of the finished structure will be based on the sum of such estimated costs. If the bid for the completed structure is accepted, a contract with the purchaser is usually drawn up, and he will then be in a position to proceed with the work.

In view of the fact that each job is often entirely dissimilar to the succeeding one in design, size and shape, comparative costs between one job and another are of little or no value. The management is interested in knowing the details of accumulated costs of the job at any given time so he may intelligently proceed with its completion with the view of a fair profit. For this reason, the planning of an Order or Job Costing system of accounts is the chief concern of the cost accountant, although for certain processes, standard costs and variance accounts may be introduced.

It may be that some of the technical terms which I have used to describe some of the plant operations are not entirely familiar to the reader, and rather than be responsible for any misinterpretation of such terms, I would prefer to clarify the operations as the steel goes through the shops.

The principal raw material used by the Steel Fabricator consists of Steel purchased from the Rolling Mills in the various structural shapes; that is,

plates, angles, bars, channels, rounds, (or rods) in different widths, lengths and chemical content. Such raw material is usually brought in by rail, unloaded and systematically stored outside in the yard for future use.

A Template is nothing more or less than a pattern or design made out of thin sheets of Basswood or Cardboard. The templates themselves are made by skilled tradesmen from Detail Blue Prints forwarded from the Drafting Department, and, of course, show the exact shape, location of holes for bolts or rivets, etc., in which the steel must be cut, punched, drilled or further fabricated. The workman, on receiving the completed template, will place it on the raw section of say, a steel plate, and usually with a piece of yellow crayon will mark the plate in the proper place to be cut or punched.

The pattern shop, of course, will construct wooden designs or facsimiles from which the steel castings are to be made. The average yearly number of castings required in an industry of this kind, as compared with the volume of other work to be done, is small, and for that reason, the Steel Fabricator does not find it practical to operate a small foundry to make his own castings. The pattern is merely delivered to a nearby foundry, and the rough, or sometimes the machined casting, is purchased from him. As a result, the pattern shop occupies a comparatively small portion of the whole plant.

Laying Out and Marking is simply the securing of the steel sections from Raw Material Stores and drawing the lines, or designs, by which the steel may be cut, punched, or drilled. In this operation, the template is found to be particularly valuable when any quantity of similar parts are to be made.

The process of Shearing, or Cutting, as it is sometimes described, is done with the aid of large machines, the principal part of which is the Shear Blade, and this blade, under pressure, will readily cut ordinary sections in straight lines smoothly and evenly in the locations marked.

Those sections of steel which, due to the special design into which they are to be cut, are not readily adapted to the Shearing operation, are cut by the Burning process. The Burning machine is an outfit with a hose and nozzle attachment through which passes a mixture of oxygen and acetylene in the form of gas. Several bottles or tanks of both oxygen and acetylene are connected to the Burning outfit and the mixture of the gas is regulated by the operator for use on steels of different carbon content, thickness and hardness. The mixture of gas when ignited and applied to the steel on the lines indicated will "burn" or cut it through as required. It is customary to cut circular, semi-circular, curved and indented sections of steel by this means as the Shearing equipment only permits cutting in a straight line.

The Punching operation requires little explanation. It consists merely of specially adapted equipment which will either punch or drill the holes in the steel for rivets or bolts.

It is the essential purpose of the Shaping or, as it is sometimes known, the Forming Department, to transform the shape of the steel section in readiness to fit into position in the sub-assembly. On occasion, the Shearing or Punching operation may unavoidably warp one of the steel sections, and it is flattened or straightened in this department. Rolling, Dishing or Hollowing, as, for instance, is necessary in fabricating boilers or cylinders,

is done here. Coping and chamfering connecting surfaces for precision fitting is also undertaken in this department. In other words, the various forming operations are wholely carried on here to identify such sections in their finished shape for fitting in the next stage of production.

The purpose of the Sub-Assembly is, of course, to fit the various pieces of each section of the job together. It is customary in a job which specifies the connections to be rivetted, to fasten the parts together with one bolt at each end and perhaps one bolt in the proper location for such parts as struts, braces and cross members. This is usually sufficient to hold the pieces in place until it reaches the Rivetting Stage when perhaps twenty or thirty rivets may be used to firmly secure such parts to withstand the anticipated strain. When welded connections are specified, the parts are primarily "tack-welded" together. The term "tack-welding" means to weld short lengths in possibly two or three places along the whole of the distance to be welded, and its purpose, as before, is merely to keep the parts in place for the final welding operation.

The Rivetting operation differs slightly from the work one may frequently see outside in the erection of a new building but the function is exactly the same. Instead of using a small manually-operated air gun accompanied by ear-splitting noises, it is done quite silently by machinery exerting much greater pressure and "squeezing" the rivet in place. The bolts used in the sub-assembly are now removed and rivets inserted in their stead.

The Welding Department completes the work of the tack-welder in the sub-assembly. At this stage, the welders will fuse whole sections of steel completely and firmly together with welding rods supplied for this purpose. It is interesting at this juncture to note the development in recent years in the Science of Electric Welding and the perfection of welding equipment. It does away with the necessity of punching, drilling and reaming out holes, making rivets and bolts, and heating and rivetting the sections in place, and, in certain classes of work takes preference over ordinary rivetted connections. The finished article is often more stable than one similarly assembled by rivets, and the writer recently had the experience to see an oil tanker, welded completely from bow to stern, launched for ocean service.

The process of Chipping and Grinding removes the rough edges and any excess welding material from the fabricated sections and leaves the surfaces smooth for the main assembly.

The main assembly, the final fabricating operation in the shop, consists merely of fitting the sub-assemblies in position, and will indicate the form in which the material will finally leave the factory for construction or erection.

It would be of little avail here to proceed with detailed explanations of the remaining operations, as the majority are more or less self-explanatory. Machine shop practise and tool room work is found in practically every modern factory and, except from a cost accounting standpoint, it is deemed unnecessary to enlarge upon them. It has merely been my purpose to create a clearer picture of the steps required in the production of such fabricated material peculiar to this industry alone.

Now, in order that the accounting procedure, and particularly those accounts which are the special concern of the cost accountant, may be properly interpreted, a sample trial balance of the General Ledger at the end of one month is given below:

A B C STEEL PRODUCTS LTD.

Trial Balance as at August 31st, 1941

Account No.	Description of Account	Dr.	Cr.
1	Cash in Bank	50,000.00	
2	Cash on Hand (Imprest Fund)	500.00	
5	Dom. of Canada Victory Bonds	75,000.00	
6	Other Investments	1,500.00	
10	Acounts Receivable—Trade	400,000.00	
11	Advance Deposits on Contracts	30,000.00	
12	Accounts Receivable—Travelling Advances and Misc.	2,500.00	
19	Provision for Doubtful Receivables		20,000.00
20	Raw Material Stores—Structural Steel	70,000.00	
21	Raw Material Stores—Purchased Parts	5,000.00	
22	Raw Material Stores—Tool Steel, Lumber, etc.	1,000.00	
30	Work in Progress—Fabricating Dept.	290,000.00	
31	Work in Progress—Bolts, Nuts and Rivets	2,000.00	
32	Work in Process—Tools, Dies, etc.	700.00	
35	Work in Process—Erection Dept.	187,000.00	
40	Finished Products Stores—Fabricating Dept.	12,000.00	
41	Finished Products Stores—Bolts, Nuts and Rivets	4,300.00	
42	Finished Products Stores—Tools, Dies, etc.	1,500.00	
45	Finished Contracts—Erection Dept.	——	——
50	Land	51,000.00	
51	Building Ledger	130,000.00	
52	Machinery & Equipment Ledger	750,000.00	
53	Office Furniture and Fixtures Ledger	19,000.00	
61	Provision for Depreciation—Buildings		20,800.00
62	Provision for Depreciation—Machinery & Equipment		309,000.00
63	Depreciation for Depreciation—Office Furniture & Fixtures		7,100.00
70	Prepaid Insurance	3,700.00	
71	Prepaid Municipal Taxes	3,200.00	
72A	Raw Material Variance Account—Bolt Shop	620.00	

Account No.	Description of Account	Dr.	Cr.
72B	Direct Labour Variance Account—Bolt Shop	77.00	
72B	Burden Variance Account—Bolt Shop		661.00
73A	Deferred Engineering Expenses	32,000.00	
73B	Engineering Expenses Absorbed		35,300.00
74A	Erection Dept.—Fixed Burden	39,300.00	
74B	Erection Dept.—Fixed Burden Absorbed		44,900.00
75	Goodwill	1.00	
101	Accounts Payable		122,000.00
102	Trade Acceptances Payable		7,000.00
103	Contracts Paid in Advance		12,000.00
104	Accrued Salaries and Wages		6,500.00
105	Accrued Workmen's Compensation		400.00
106	Accrued Sales Tax		44,000.00
107	Premiums Accrued on Foreign Exchange		10,700.00
108	National Defense Tax Deposit Account		480.00
109	Employees' War Savings Deposit Account		700.00
110	Provision for Dominion Income Taxes, 1941		15,000.00
111	Provision for Dominion Excess Profits Tax, 1941		7,500.00
150	Capital Stock—Common		1,200,000.00
160	Earned Surplus Account		199,113.25
201	Sales—Fabricating Dept.		570,000.00
202	Sales—Erection Dept.		361,000.00
203	Sales—Bolts, Nuts, and Rivets		17,000.00
204	Sales—Tools, Dies, etc.		11,400.00
205	Sales—Scrap, Waste, etc.		5,100.00
211	Cost of Sales—Fabricating Dept.	478,000.00	
212	Cost of Sales—Erection Dept.	320,000.00	
213	Cost of Sales—Bolts, Nuts and Rivets	14,000.00	
214	Cost of Sales—Tools, Dies, etc.	9,400.00	
220	Office Expenses	11,900.00	
230	Selling Expenses	8,700.00	
240	General and Administrative Exp.	24,600.00	
300	Interest Received on Investments		843.75
900	General Factory Burden	——	——
1000	Engineering Dept. Operating Ledger	——	——

Account No.	Description of Account	Dr.	Cr.
1100	Drafting Dept. Operating Ledger	——	——
1200-3200	Factory Operating Ledgers	——	——
4000	Erection Dept.—		
	Operating Burden	——	——
	Totals.....	3,028,498.00	3,028,498.00

In dealing with the first element of cost on any job, it will be necessary to consider the cost of Engineering the project. The office building in reality houses two sources of direct costs in addition to the space allocated for office and administrative activities. The building is a three-storey structure, the main floor being occupied by the office, the second floor for the use of the Engineering Dept. and the third floor is reserved for the Drafting Dept.

The chief activity of the Engineering Dept., of course, is the planning of the designs of the various projects. In a job where the Steel Fabricator acts as the General Contractor, the Engineering expert will design the form of the completed structure, calculate the class, type, weight, lengths, and strength of the steel sections necessary to withstand the weight of the load, its stability in resisting the stress of wind and storm, and the effect of the sun in heating and expanding the steel, and it is on the basis of such calculations that the Steel Fabricator is enabled to prepare his estimated costs, and finally his bid on the project.

Inasmuch as every Engineered project does not necessarily result in another contract for the Steel Fabricator, perhaps because of the excessive cost of the finished project, the competitor being in a position to start the work sooner, or in the case of a special job, being better equipped to handle it, can fabricate it more cheaply, a considerable portion of this work is unavoidably "lost", and it would not be reasonable that those bids, which result in actual contracts, should directly absorb the cost of such "lost" work. For that reason, it is desirable to ascertain the engineering costs applying to each project thus designed, and with this end in view, the Engineer's detailed calculations on the project take the form of a permanent record filed in numerical order. In order that the cost of Engineering may be accumulated, the Engineer's Time Report is prepared somewhat as follows:

A B C STEEL PRODUCTS LTD.

Engineering Time Report for Week Ending August 13, 1941

Name—J. Jones

Date	Project Numbers 200	203	206	207	209	210	....	....	Total Hours
Aug. 8th	8	....	....	....	....	....	....	....	8
" 9th	8	....	....	....	....	....	....	....	8
" 10th	7	1	....	....	....	....	....	....	8
" 11th	....	8	....	....	....	....	....	....	8
" 12th	....	....	4	4	....	....	....	....	8
" 13th	....	....	....	....	3	1	....	....	4
Total	23	9	4	4	3	1	....	....	44

For Accounting Dept. Only

Gross Salary	$75.00
Rate Per Hour	1.705

For Cost Dept. Only

Total Hours..	23	9	4	4	3	1	....	....	44
Value	$39.18	15.35	6.82	6.82	5.12	1.71	....	....	$75.00

A. B. C. Calculations D. E. F. Approved G. H. H.

Approved..... Correct ..... For Payment.....

Chief Engineer Acct'g. Dept. Gen. Mgr.

The Engineer's Expense Account Report also enables the cost accountant to charge Travelling Expenses directly against the project and a sample form is given below:

A B C STEEL PRODUCTS LTD.

Expense Report, Week Ending August 31, 1941

Engineering Dept. ..... W. Smith Name .....

Aug. 8	40	2.40	.....	3.50	2.00	.....	.....	7.90	200
" 9	40	2.40	.....	3.50	2.50	4.50	.....	12.90	200
" 10	....	.....	.....	.....	.....	.....	.....	.....	.....
" 11	15	.90	.....	.....	.....	2.00	.....	2.90	203
" 12	....	.....	.....	.....	.....	.....	.....	.....	.....
" 13	....	.....	.....	.....	.....	.....	.....	.....	.....
Total	95	5.70	.....	7.00	4.50	6.50	.....	23.70	

A. B. C. Calculations D. E. F. Approved G. H. H.

Approved..... Correct ..... For Payment.....

Chief Engineer Acct'g. Dept. Gen. Mgr.

All expenses of the Engineering Dept. are kept by a separate control in the General Ledger, and the detailed expenses are itemized in the Engineering Dept. Operating Ledger. To each item of expense is assigned an appropriate code number, and the principal expenses are classified as follows:

Account No.	Description
1001	Engineering Salaries.
1005	Travelling Expenses—Engineering Dept.
1012	Engineering Dept.—Clerical Wages.
1031	Office Stationery.
1032	Heat and Light.
1051	Depreciation—Building.
1052	Depreciation—Office Furniture and Fixtures.
1053	Property Taxes.
1054	Insurance.
1098	Miscellaneous.

The cost accountant, at the end of each month, prepares a summary by Project numbers, of all the Engineering Time Reports for the period, showing not only the value of all direct work against the project, but also the number of hours applying against each. The indirect departmental expenses represented above, by the code numbers 1012 to 1098, are apportioned to each project on the basis of direct labour hours, and the summary when completed would appear somewhat as follows:

A B C STEEL PRODUCTS LTD.

Allocation of Engineering Dept. Expenses—August, 1941

Project No.	Direct Expenses Salaries	Travelling Expense	Indirect Expenses	Direct Labor Hours	Apportionment	Total Cost
200	546.00	122.00	.....	273	54.60	722.60
201	90.00	.....	.....	45	9.00	99.00
202	140.00	30.00	.....	70	14.00	184.00
203	150.00	.....	.....	75	15.00	165.00

204	70.00	.....	.....	35	7.00	77.00
211	260.00	70.00	.....	130	26.00	356.00
212	64.00	.....	.....	32	6.40	70.40
Total	3200.00	700.00	320.00	1600	320.00	4220.00

The whole of the Engineering Dept. Expense is now transferred by Journal entry to Suspense in the General Ledger, the entry for which is simply:

Deferred Engineering Expenses 4,220.00
Engineering Dept. Operating Ledger..... 4,220.00
To close Engineering Expenses for August 1941 into Suspense.

A copy of the list, finished by the Sales Manager each month, of all those Engineering Projects accepted by the customer, and now taking the form of a contract enables the Cost Accountant to determine his direct engineering costs applicable to each contract, and his entry follows:

Work-in-Process—Contract 5127
Work-in-Process—Contract 5128
Work-in-Process—Contract 5129, etc. Total 3,170.00
Engineering Expenses Absorbed 3,170.00
To charge Work-in-Process with Cost of Engineering Services applying to Contracts secured during August, 1941.

As explained previously that all of the investment in Engineering Services does not necessarily result in new contracts, it becomes necessary to absorb a portion of the value of the "lost work" each month. An estimated monthly amount based on past experience is absorbed in Administrative and General Expenses and serves to prevent inflation of the net asset value of Deferred Engineering Expenses. The entry, of course, is simply:

Administrative and General Expenses 1,000.00
Engineering Expenses Absorbed 1,000.00
To write off during August 1941 estimated monthly losses on account of cost of Engineering Services incurred not directly applicable to contracts secured.

As the Engineering Project is developed into a contract, it is next necessary to draw a number of detailed plans for the job, and the ascertaining of Drafting Dept. costs is the next consideration.

The importance of accuracy in this class of work cannot be too strongly emphasized inasmuch as every succeeding step of the work in the Planning Office, in the Plant itself, and in the erection of the various sections in the field, depend entirely upon the absolute accuracy of the Drawings. This fact is easily appreciated when, for instance, a number of workmen are engaged in erecting the steel for a fifteen-storey office building. Just imagine, perhaps, that the rivet holes in one of the connecting beams or columns for the tenth floor are punched only one inch out of place. Such an error may mean sending the section back to the plant for correction, the loss of valuable shop time and material, freight charges to the plant and return, to say nothing of the cost of delays in the field. A considerable investment in faultlessly prepared plans and drawings is, then, more readily understood and their value is amply repaid in eliminating costly and unnecessary expenditures on this account.

In drawing the plans for any of the major contracts, the completed plan of the structure is "broken down" into a hundred or more sections or parts. A separate drawing of each section is made and the blueprints delivered to all those concerned, both in the shop and in the field, and serve as instructions or guides by which the material is fabricated or erected. Each section of the structure is classified primarily by code letters such as AA, AB, AC, BA, BB, etc., and each piece of steel used in the section is further identified by numbers commencing with 1 to possibly 100. Consequently the number 517-AB-32 would indicate to the workman a particular piece of fabricated steel on Drawing AB for Job No. 5127.

As will be noted in the case of the Engineering Dept., the principal costs incurred in this dept. are Draftmen's salaries and wages. The Drafting Dept. staff prepare a time report essentially similar in form and purpose to those prepared by the engineers, and indicate the length of time spent in drawing plans for each section of the job. The various expenses found in the Drafting Dept. operating ledger are similarly balanced with the General Ledger control and are assigned appropriate code numbers from 1101 to 1199 for identification and distribution against the various jobs. An allocation summary of the time reports very much like that previously shown is prepared each month to indicate the total number of direct labour hours and the direct labour cost of each job. Direct labour hours in this department as well forms the basis for distribution of indirect charges. The entry to close out the departmental operating expenses for the month is simply:

Work in process (as per detail on file).....	7,000.00	
Drafting Dept. Operating Ledger		7,000.00

To close out Operating Expenses of Drafting Dept. for August 1941 to Work in Process.

It might be well, for the sake of clarity, to mention that the "lost work" factor is not encountered here: a definite contract is secured before commencing any detail drawing and, in consequence, all Drafting Dept. Expenses are applicable to actual contracts rather than projects as before.

We have now reached the point where the actual Fabrication processes are carried on in the plant, and the principal devices commonly used in each process for securing cost information is the Workman's Daily Time Report and the Material Requisition.

gal 5—cost and management

A rough sketch of the Workman's Time Report is given below and indicates the essential information:

A B C STEEL PRODUCTS LTD.
Workman's Daily Time Report

Dept. Forming

Aug. 13, 1941 (Date)		Johnny Johnson (Name of Employee)	264 (Check No.)	.60 (Rate)
Contract No.	Section No.	Class of Work	Machine No.	No. Hours
5127	AC	1501	1575	3
5134	HR	1501	1575	3
5170	DM	1504	1578	1
5146	NP	1503	1577	1
Total Hours Worked				8

The workman, or his foreman, enters all the information with the exception of the hourly rate, on the time report daily. The Timekeeper, after verifying the hours worked with the clock card, inserts the hourly rate and sends the report to the office for distribution of labour costs.

A sample of the Material Requisition is given below:

A B C STEEL PRODUCTS LTD.

Material Requisition — Dept. Lay-Out

Aug. 13, 1941 (Date) 5127 (Contract No.) AB (Section No.)

No. Pieces	Structural Shape	Specification	Finished Length	Gross Requirements	Figured Weight (For Cost Dept. Use Only)	Price Per Lb. (For Cost Dept. Use Only)	Value (For Cost Dept. Use Only)
3	Channels	12″x25	12′7″	38′0″	.....	.....	.....
2	Angles	2x2x¼	10′9½″	22′0″	.....	.....	.....
1	Rod	⅞″ Dia.	4′0″	4′0″	.....	.....	.....
16	Plates	36x⅜	20′0″	320′6″	.....	.....	.....

Little explanation of the Material Requisition is necessary, except perhaps the terms "Gross Requirements" and "Figured Weight". In the former case, from the first item on the requisition, we note that 3 channels, each of a finished length of 12 feet 7 inches, are ordered. This represents a total finished length of 37 feet 9 inches and the gross requirements in lineal feet indicate that the usage is reported as 38 feet 0 inches, the difference, of course, being the necessary cutting allowance and the factor of "short ends".

As we have seen, the material requirements are primarily shown in lengths rather than weight. It would be impractical to actually weigh the gross requirements, and in order to overcome this difficulty, Engineers in the past have developed charts or tables indicating the weight per lineal foot of steel in the various shapes. Again referring to the first item of the requisition shown, we note that the specification reads 12 inches by 25. This merely represents the width of the channels, namely 12 inches, and the number 25 indicates that the type of channel to be used weighs 25 lbs. to the foot. While these "Figured Weights" are not, for several reasons, absolutely accurate, experience has shown that, for practical purposes, the use of such figured weights has proved surprisingly accurate when checking book against physical inventories over a period of months.

In the actual fabrication of the Structural Steel, we find the cost accounting procedure in the majority of the processes, to all intents and purposes, similar. Those processes falling into this category for costing purposes include the Pattern Shop, Template Dept., Lay-out and Marking Dept., Shearing, Burning, Punching and Drilling, Forming, Sub-Assembly, the Forge, Rivetting Dept., Welding Dept., Chipping and Grinding, Main Assembly, Painting and Inspection Depts.

For the purpose of illustration, then, we will use one of the larger departments, namely, the Forming Dept., and, inasmuch as most of the Structural Material is requisitioned in the Lay-out process, the principal object is the allocation of labour and overhead charges against the job.

A summary of detailed expenses in the Factory Operating Ledger—Forming Dept.—are identified by the following code numbers:

No. of Account	Description
1501	Direct Labour—Bending.
1502	Direct Labour—Rolling.
1503	Direct Labour—Flattening.
1504	Direct Labour—Straightening.
1505	Direct Labour—Chamfering
1506	Direct Labour—Coping.
1511	Direct Departmental Labour—Supervision.
1512	Direct Departmental Labour—Sweeping and Cleaning.
1513	Direct Departmental Labour—Transporting Work in Process.
1521	Direct Structural Material Used.
1522	Other Direct Material Used.
1531	Indirect Departmental Supplies — Wiping Cloths, Brooms, etc.
1532	Light and Heat.
1533	Steam Power—(Apportionment).
1534	Electric Power—(Apportionment).
1541	Repairs and Maintenance—Forming Dept. Building.
1542	Repairs and Maintenance—Machinery and Equipment.
1543	Repairing and Redressing Machine Tools, Dies, etc.
1544	Machine Tool Replacements.
1551	Depreciation—Forming Dept. Building (Apportionment).
1552	Depreciation—Forming Dept. Machinery and Equipment.
1553	Property Taxes—(Apportionment).
1554	Insurance—(Apportionment).
1554	Insurance—(Apportionment).
1598	Miscellaneous Dept. Expense.
1599	Apportionment—General Factory Burden.

A B C STEEL PRODUCTS LTD.

Allocation Statement for the Month of August, 1941—Forming Dept.

Contract No.	Section No.	Direct Labor Bending Hrs.	Bending Amt.	Rolling Hrs.	Rolling Amt.	Flattening Hrs.	Flattening Amt.	Total Hrs.	Total Amt.	Direct Material Structural	Direct Material Other	Indirect Expense % Applicable	Indirect Expense Apportionment	Total Departm'l Cost
5127	AB	2	1.30	3	1.80	9	4.50	14	7.60	.....	.....	1.57	.13	9.30
5127	AR	8	4.85	10	7.00	8	4.25	26	16.10	.....	.....	.....	.50	16.60
5161	AA	24	14.40	25	17.50	21	10.50	70	42.40	.....	6.10	8.41	7.40	55.90

Charges for direct labour, the source of the larger portion of expense in this department, and represented by the code numbers 1501-1506 inclusive, are secured from a recapitulation of the workmen's time reports. This recapitulation, or allocation statement, shows the direct labour hours applying to each job as well as the Direct Labour cost, and as may be imagined, indirect expense or burden, is distributed to each job on the basis of direct labour hours. The allocation summary for the month of August, 1941, might appear, in part, as follows:

As we have said, the few examples given above will serve to illustrate the basis for accumulating departmental costs against each contract, and the Journal Entry closing out the accounts of this department, as well as others to which the same costing procedure is applied, is simply:

Work in Process ..... $———
    Factory Operating Ledger—Forming Dept. $———
        To close the Operating Accounts of the Forming Dept. for the month of August, 1941.

It will be noted that, in the description of the expense accounts in the Forming Dept., the term "Apportionment" has been applied to several of these items, and a word of explanation is necessary to demonstrate the basis for distributing to departments, the total cost of such items.

Depreciation of buildings is set up every month by Journal Entry, and a proportionate amount, based on the area of floor space occupied by each department, is charged direct to the Departmental Operating accounts.

A Plant Machinery and Equipment ledger, with a corresponding Depreciation Reserves ledger, indicates in which department the machine is in use, and, when the details of Depreciation are entered in the Reserves ledger each month it is possible to charge the Departmental Operating account direct with depreciation on its own machinery.

Property taxes are also charged to the Departmental Operating accounts direct, and the charge is pro-rated on the basis of net capital investment at the beginning of the year. The Plant Machinery and Equipment ledger and Reserve ledger will furnish the net amount of capital invested in each department, and the net investments in Buildings is distributed on the basis of floor space occupied.

Insurance is distributed in exactly the same manner as Property Taxes.

The apportionment of Steam Power costs is the only item which requires any lengthy calculations, but any time spent in making these calculations is later shown to be worth while, particularly when considering the problem of Machine Shop Costs.

Engineering advice establishing the Horse Power rating of each machine in the various departments has furnished a basis for distributing Steam Power costs. A reasonably accurate apportionment may therefore be made on the basis of Departmental Horse Power consumption easily arrived at from a schedule prepared monthly and an example of the working sheet is given on the next page.

The examples given on our working sheet for the Forming Dept. and the Machine Shop are sufficient, I believe, to portray the basis of distribution of total Steam Power costs to all departments, and, in addition, our working sheet is the source of two other important items of information. The management, from the net machine hours, can determine the operating efficiency, or the percentage of capacity, at which the plant is running, and essential data for Machine Shop costing, to be shown later, is furnished.

Electrically driven machinery, including electric welding equipment, which in itself consumes a great deal of electric power, is also distributed on the same principle as steam power costs. The power unit in this case is, of course, the Kilowat, and the total Kilowat hours consumed in each department will decide the distribution of this item of cost.

A B C STEEL PRODUCTS LTD.

Allocation of Steam Power Costs—August, 1941

Dept.	Description of Machine	Total Dir. Lab. Hrs.	No. Men Operating Machine	Net Machine Hours	H.P. Rating	Total H.P. Units	Total H.P. Units by Depts.	% to Total	Apportioned Steam Power Cost
Forming—	Bending	140	2	70	60	4200			
	Rolling	240	3	80	40	3200			
	Flattening	120	2	60	35	2100			
	Straightening	140	2	70	30	2100			
	Chamfering	160	2	80	25	2000			
	Coping	75	1	75	25	1875			
Total—Forming Dept.		875		435		15475	15475	14.07	$464.25
Machine Shop—	No. 2075—Lathe	140	1	140	30	4200			
	No. 2076—Lathe	160	1	160	25	4000			
	No. 2077—Lathe	125	1	125	25	3125			
	No. 2080—Planer	110	1	110	20	2200			
	No. 2081—Planer	115	1	115	25	2875			
	No. 2085—Shaper	130	1	130	25	3250			
	No. 2090—Boring Mill	100	1	100	35	3500			
	No. 2091—Miller	110	1	110	25	2750			
	No. 2093—Radial Drill	90	1	90	20	1800			
Total—Machine Shop		1080		1080		27700	27700	25.18	$831.00
Total—Steam Power Costs							110000	100.00	$3300.00

Charges for direct labour, the source of the larger portion of expense in this department, and represented by the code numbers 1501-1506 inclusive, are secured from a recapitulation of the workmen's time reports. This recapitulation, or allocation statement, shows the direct labour hours applying to each job as well as the Direct Labour cost, and as may be imagined, indirect expense or burden, is distributed to each job on the basis of direct labour hours. The allocation summary for the month of August, 1941, might appear, in part, as follows:

Apportionment — General Factory Burden:— This item includes salaries and wages of Plant Supervision, Employment Agent, Factory Clerks, Watchmen and Guards, First-aid Men, Storekeepers, Timekeepers, Plant Stationery, Depreciation Plant Office Furniture and Fixtures, First-aid Supplies and other items of expenses which are applicable only to the factory as a whole. Expenses contained in General Factory Burden are somewhat similarly controlled by the General Ledger, and are distributed to the departments on the basis of the average number of workmen employed in each department during the month.

While the costing procedure outlined above for the Forming Process is applied to most of the Fabricating departments, there still remains the Bolt and Rivet Shop, the Machine Shop, and the Toolroom, which for various reasons require a different method of handling.

Under ordinary circumstances, the problem of ascertaining the cost of manufactured Bolts and Rivets is a comparatively simple task, but conditions, particularly during the last year or two, have made it necessary for the cost accountant to give a great deal of thought to these costs.

This department, in addition to manufacturing Bolts and Rivets of various diameters and lengths for subsequent use in the Assembly Process, maintains an inventory to supply the demand of an outside market for such material as a finished product. In recent times, the difficulty in obtaining supplies of raw materials in sufficient quantities to insure continuous production, has had a startling effect on costs. Former sources of raw material have not been able to fill all requirements as ordered, and, from time to time, it has been necessary to purchase Bolt and Rivet Steel from a more distant source with a consequent increase in base prices. Again, in the past, a production order for 40,000 rivets of the same dimension might be completed without interruption, and today the Raw Material inventory may permit the processing of only 10,000 units of the same articles. If any length of time is taken to set up the machine to produce the rivets, as compared with actual running time, one can very readily imagine the resulting variance in costs between an order for 10,000 rivets and an order for 5,000 rivets of the same dimension.

Of all the various processes in the whole plant, it is in this department alone that we can see work of the same nature being done day by day, week by week, and year by year, and in view of present conditions, experience has shown that "Standard" costs applied to the product of this department solves our problem most effectively.

Standard material costs, as far as quantities are concerned, present no difficulty whatsoever inasmuch as the manufacturing process, and the weight of material required to make a quantity of 1,000 rivets is exactly the same as in former years. Our standard weights, then, have been based on the average material requirements for the past two years. Standard material prices are adjusted, if necessary, each month to conform to current laid-down quotations on material requirements. Direct labour, in terms of hours required to produce 1,000 rivets, is standardized from the average for the fiscal year, July 1st, 1940, to June 30, 1941, a representative duration of time in which raw material supplies were scarce and making it imperative to produce in smaller quantities. The Standard Direct Labour cost per hour is taken from prevailing wage schedules and adjusted each month if found necessary. Burden, in this department, is not subject to the same degree of variance as material and labour costs, and the standard burden rate per hour of direct labour is adjusted quarterly to compare with actual Burden costs for the preceding three months.

As we have mentioned, Bolts and Rivets are manufactured for stock by authority of the Bolt Shop production order, and for the purpose of comparison, actual burden is distributed to such production orders on the basis of actual direct labour hours;— direct labour and material, of course, being charged against the Production order rather than a contract as in the case of the structural processes.

The cost sheet for Production order No. B-1067 appears on the next page.

Bolts and Rivets are charged to Finished Products Stores at Standard Prices and the following summary prepared monthly provides the necessary information for closing the Bolt Shop operating accounts for the month, and, in addition serves as the controlling medium for entries posted in the Manufactured Bolts and Rivets Ledger.

A B C STEEL PRODUCTS LTD.

Summary of Actual and Standard Production Costs for August, 1941

Materials		Labor		Burden		Total Costs	
Actual	Standard	Actual	Standard	Actual	Standard	Actual	Standard
Order No. B-1007—							
105.00	100.00	51.00	50.00	17.00	18.00	173.00	168.00
Order No. B-1008—							
260.00	248.00	47.00	45.00	16.00	16.80	323.00	309.80
Order No. B-1009—							
170.00	165.00	41.00	40.00	15.00	15.70	226.00	220.70
(Other)—							
.....	.....	.....	.....	.....	.....	.....	.....
Totals—							
5000 00	4900.00	2600.00	2400.00	750.00	850.00	8350.00	8150.00

The closing entry, of course, is simply:

Finished Products Stores—Bolts, Nuts and Rivets.....	8,150.00	
Raw Material Variance Account—Bolt Shop	100.00	
Direct Labor Variance Account—Bolt Shop	200.00	
Burden Variance Account—Bolt Shop		100.00
Factory Operating Ledger—Bolt Shop		8,350.00

To close Bolt Shop Operating Accounts for August, 1941.

A B C STEEL PRODUCTS LTD.

Bolt Shop Cost Sheet — Production Order No. B-1067

5000	Hex.Hd.Mach.Bolts	SAE 1030 Rds.	⅜"	3"	N.C. 2	Aug. 28/41
Quantity	Description	Specification	Diam.	Length	Thread	Date C'mpl't'd

Variance Summary

Material	Quantity	Price Per	Total	Cost Per	Over or (Under) Stand.	
						Per 100
	in Lbs.	Lb.	Value	100 Units	Value	Units
Actual	2600	.0255	66.30	1.33		
Standard	2550	.0250	63.75	1.28		
Variance	.....	.....	.....	.....	2.55	.05
Labor						
	Direct Labor Hrs.	Price Per Hr.	Total Value	Cost Per 100 Units		
Actual	52	.5000	26.00	.52		
Standard	50	.4800	24.00	.48		
Variance	.....	.....	.....	.....	2.00	.04
Burden						
	Direct Labor Hrs.	Price Per Hr.	Total Value	Cost Per 100 Units		
Actual	52	.1400	7.28	.14		
Standard	50	.1500	7.50	.15		
Variance	.....	.....	.....	.....	(.22)	.01
Total Costs—						
Actual			99.58	1.99		
Standard			95.25	1.91		
Net Variance—Over Standard			4.33	.08	4.33	.08

The problem of Machine Shop costing is the next step to be considered and the costing procedure to be followed requires careful thought and planning. The capital invested in this type of equipment is unusually

heavy and, as a result, it must be made to pay. General economic conditions will have its effect on the Cost Accounting system to be adopted and while the "Idle Machine" factor is met with in "Depression" years, the machines are undoubtedly operated to capacity on Defense contracts during wartimes. It is easy to see, then, that cost accounting procedure must be varied, and it is my intention to show how the "Production Centre" or "Machine Hour" method of Cost Accounting may be very effectually applied in this department, particularly during the present times.

The principal object in view, then, is the determination of the machine cost per hour, and the calculation of the number of machine hours against each contract or job, multiplied by the cost per hour, will indicate our Machine Shop costs.

To ascertain our "Machine Hour" cost by the "Production Centre" method, we apply all departmental costs, with the exception of raw materials used, against the machine rather than the job, as follows:

A B C STEEL PRODUCTS LTD.

Machine Operating Costs for the Month of August 1941—Machine Shop

Machine Number and Description

Acct. No. and Classification of Expense	No. 2075 Turret Lathe	No. 2076 Eng. Lathe	No. 2090 Vertical Boring Mill	No. 2091 Milling Machine	No. 2092 Radial Drill	(Others)	Total
Direct Charges—							
2001–Prod. Labor							
2003–Gr. Mach. Tools							
2010–Mach. Tool Repl.							
1015–Redress Tools (from Tool Room)							
2016–Steam Power Cost (Apportionment)							
2017–Elec. Power Cost (Apportionment)							
2082–Depreciation							
2092–Rep. & Maint.							
2093–Taxes							
2094–Insurance							
Other direct charges applicable to machine							
Total Direct Charges							
Indirect Charges—							
2005–Indirect Labor Supervision							
2006–Indirect Labor Sweepers, Cleaners, etc.							
2026–Dept. Supplies							
2081–Depreciation Bldgs.							
Misc. Dept.—							
2098–Expenses							
General Factory—							
2099–Burden							
Total Indirect Charges							
Total Expense							
Hours Operated							
Cost Per Hour							

In the above, we obtain many of our direct charges, such as Machine Depreciation, Power Costs, etc., from the monthly Journal Entry setting up such depreciation, and Power Costs from our monthly Power Allocation Statement. Of the indirect charges, we apportion account No. 2081—Depreciation Buildings—on the basis of floor space occupied, and the remaining indirect charges, on the basis of total Machine Hours operated.

The Machine Shop Allocation Summary would indicate merely the following:

A B C STEEL PRODUCTS LTD.

Allocation Statement for the Month of August 1941—Machine Shop

Cont. No.	Sec. No.	Mach. No.	MACHINE HOURS Hours Worked	Mach. Cost Per Hr.	Tl. Mach. Cost	Material Costs	Total Costs
5127	AC	2075	10	1.625	16.25		
		2090	4	1.805	7.22		
			14		23.47	21.69	45.16
5127	AE	2075	14	1.625	22.75		
		2091	2	1.403	2.81		
			16		25.56	10.61	36.17

Again the entry closing out the Machine Shop Operating Accounts is simply:

Work in Process (as per detail on file)..... $———

Machine Shop Operating Ledger ..... $———

To close Machine Shop Operating Accounts for August, 1941.

In several ways, this manner of Machine Shop costing has a distinct advantage over other possible methods in that it will indicate to the management whether or not his machine cost per hour is in line with outside competition: form a more accurate basis for estimating on Machine Shop work; serves as a quick source of costs applicable to orders received for Machine Shop work only; and, not to say the least, the difference between actual machine hours operated over a period, and the maximum machine hours available, will serve as a rough guide by which additional Machine Shop time may be "ear-marked" for extra defense work, a decidedly important factor during these times.

The procedure in the Tool Room varies slightly from that previously shown for the Forming Department. All Special Tools, Replacement Tools, and tools and dies manufactured for the outside market are manufactured from the Tool Room Production order, and costs are applied and accumulated against the production order. The cost of redressing and repairing tools and dies currently used in each of the other departments is charged directly to an appropriate overhead standing work order for each department. The basis of securing cost information for material and direct labour charges is essentially similar to the method adopted in the Forming Department, and Tool Room Burden is likewise on the basis of direct labour hours. The classification of costs accumulated in the Tool Room Allocation Summary, however, includes items of expenditure incurred for a distinctly separate purpose, and the entry closing out the operating accounts is, of necessity, of a compound nature and might be shown thus:

Finished Products Stores—Tools, Dies, Jigs, etc.

Work in Process—Tools, Dies, Jigs, etc.

Forming Department Operating Ledger—Account No. 1515.
Machine Shop Operating Ledger—Account No. 2015.
Factory Operating Ledger—Tool Room.

To close operating accounts of the Tool Room for the month of August, 1941.

The inventory investment in Finished Tools and Dies with the exception of those tools, which from experience are certainly to be required at a later date, is kept at a minimum, and, when used in any of the other departments in the plant, or to fill special orders for the outside market, are drawn by requisition from Finished Products Stores on the "Average" price basis.

In the foregoing, we have attempted to illustrate the methods used to ascertain costs of each individual job in the various departments, and a word or so of explanation is necessary to show the plan adopted to accumulate total costs against any contract, both for the purpose of the final cost sheet, and for General Ledger control.

As the finished section leaves the Inspection Department and is stored in the yard for shipment in the very near future, a printed memorandum form indicating the Contract No., Section No., and date completed, enables the Cost Department to cross-add and complete the Work-in-Process ledger sheet and to transfer the total cost of the section from Work-in-Process to Finished Products Stores.

It will be noted that we have deliberately omitted Shipping Department costs from the picture up to the present time, the reason being that any costs incurred here will find their way into two entirely distinct operating accounts. Citing an example to illustrate the principle, let us say that in one case the contract calls for three large heat-treating furnace shells to be installed by the customer himself at a later date on his own premises, and the contract is quoted F.O.B. our plant. Shipping charges on an item of this nature will properly find their way directly into Cost of Sales. On the other hand, let us assume that the contract calls for the fabrication and erection of the Steel Framework for a new factory building. In this case the Steel Fabricator does not receive his money until the steel is entirely erected on the site, and any storing and shipping costs against a contract of this kind becomes an added investment in the contract and is properly charged to Work in Process—Erection Department.

The basis of determining Shipping Department costs is, however, exactly similar to that shown for the Forming Department, and the skeleton Journal entry closing the operating accounts of the Shipping Department is simply:

Work-in-Process—Erection Dept. ..... $———
Cost of Sales ..... $———
Factory Operating Ledger—Shipping Dept. $———

To close the operating accounts of the Shipping Department for the month of August, 1941.

Up to the present time, we have considered only those processes involving the fabrication of the material in the plant itself. The final step, in completing a large number of contracts is the erecting of the Fabricated material on the site, and while work of this nature often requires the handling of large numbers or groups of workmen, and the purchasing of

materials and supplies for use solely on the site, the problem confronting the cost man in maintaining erection cost records is easily solved for one basic reason. In the erection processes, we find that one group of workmen is entirely engaged in erecting one contract only, and erection payroll summaries are kept individually for each contract in process. In order to illustrate the situation more effectively, let us glance for a moment at the function of the plant process as compared with the erection process. In the plant process, we may find that one workman may drive rivets on as many as 5 or 6 different contracts in one day, whereas, in the field, say in the erection of a bridge over the St. Lawrence River, we find that the efforts of the workman for weeks may be wholely applied to the erection of one contract only, due to the locality of the site.

As a result we find that erection salaries and wages are not subject to distribution between one contract and another and are easily applied against the individual contract, and, in addition, operating materials and supplies ordered from the erection stores department at the plant, or purchased directly from sources near the site, are readily segregated against the proper contract.

The elements of expense contained in the Erection Department Burden are divided into two separate and distinct classes;— namely the Erection Department Operating Burden and the Erection Department Fixed Burden. The former classification includes salaries and wages of the General Field Superintendent, Erection Department clerks and storekeepers, fixed charges against the erection stores building, etc., and are readily distributed against each contract in process of erection on the basis of total direct labour hours each month.

The problem of determining Erection Department Fixed Burden, however, is perhaps the most unwelcome task which can be allotted to any cost man, and the writer, I believe, is justified in attributing to this factor alone the reason for any prematurely grey hair.

Depreciation of Erection equipment, taxes, licenses, insurance and other items of a fixed nature constitute the principal components of expense in this category, and the monthly accruals of fixed charges are debited against the various units of erection equipment in order to obtain the total fixed charges against any piece of equipment in the period.

On January 1st of each year, an estimate is made of the probable number of hours in which the machine is expected to be in use during the succeeding three months, and the cost of fixed charges per hour operated is calculated. From a report indicating the units of equipment supplied for use on the job, and the number of hourse such equipment is in use, we are able to make a charge to Erection Work in Process with such applied fixed charges.

Now, in an enterprise of this kind, it is impossible at the beginning of any accounting period to forecast with any degree of accuracy the probable extent to which erection equipment will be used during the period. At the beginning of the year, the Steel Fabricator cannot, like an industry manufacturing a staple article for which the probable demand can be estimated with reasonable accuracy, forsee the exact nature of the contracts which will come his way. From past experience and known facts, he may say that his erection equipment may be in use for an average of 60 working days out

of a possible 78 days and on this basis he may estimate his cost of fixed charges per hour. However, about 10 days after the writer had completed his primary estimates, several unforseen contracts came our way and we found that rather than working the equipment 60 8-hours days out of a possible 78 days, certain units at a later date would be put into use 24 hours per day, 7 days a week. To complicate matters further, about a month after this disaster, it was found possible to rent certain intermittently used units of equipment to outside parties at a good figure, and as a result, the "coloured gentleman in the woodpile" was that, by March 31st, we had substantially "over-earned" our Erection Department Fixed Burden.

As a result of this experience, it has been necessary for the Cost Department to scrutinize this item very carefully at the beginning of each month and revise the Fixed Burden rates per hour to fall in line with known facts and probable use as far as is humanly possible.

As the various sections of the job are shipped from the plant to the field for erection, the investment in this work is, of course, transferred from Finished Products—Fabrication to Work in Process—Erection, and erection costs are accumulated in the Work in Process—Erection Department ledger in a manner very similar to the plan used for the Fabrication Processes. The essential difference, however, is that, while plant cost records are kept for each section of the job, in the field, costs for erecting the job are only kept for the contract as a whole.

As the contract is completed, it is simply a matter of transferring the investment from Work in Process—Erection Department to Finished Contracts—Erection Department, and the contract, as a rule, is billed to the customer immediately upon completion of the work.

In concluding, I would like to say only a word or two about my reasons for adopting the system which I have attempted to describe, and the value of such cost information to the business as a whole.

As present conditions indicate that wages are subject to almost continuous fluctuations, I believe that the apportionment of burden on a direct labour hour basis is preferable to the method of distributing this item of expense on the "Dollar-hour" basis, and when new workmen are engaged, perhaps at a rate slightly less than the old employees doing the same kind of work, the plan still represents a fairly accurate apportionment of burden in general. It also has a decided advantage in readily indicating to the management, the operating efficiency of the plant, either by departments or as a whole, and plans may be made to utilize the facilities to 100% capacity to further our war effort.

While it may appear to be a laborious task to maintain individual costs for each section of a contract, it is necessary for inventory valuation purposes, and, when estimating costs on new projects, information relative to one particular section of a contract, has been found to be of inestimable value.

Our plan for Machine Shop costing on the Production Centre method is, I believe, as accurate as can be determined. When capital investment in equipment is heavy, and resulting Fixed charges for depreciation, etc., increase in ratio to the cost of a direct labour hour, the "Machine Hour"

cost is perhaps the most satisfactory basis to allocate this expense, and, as I have stated previously, from information available showing the Machine Hours operated as compared with capacity, we can make an attempt to utilize our facilities to the utmost to keep Adolph in his place across the Atlantic.

* * *

Unfortunately it was found impossible to publish certain diagrams and illustrations prepared in this thesis. Editor.

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by Oneofem

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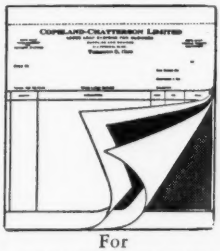

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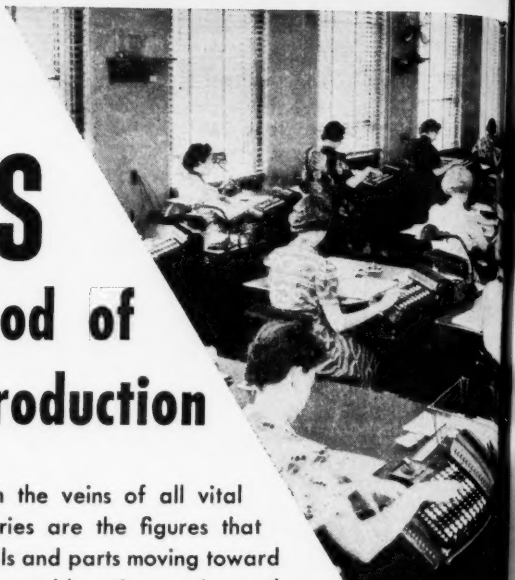

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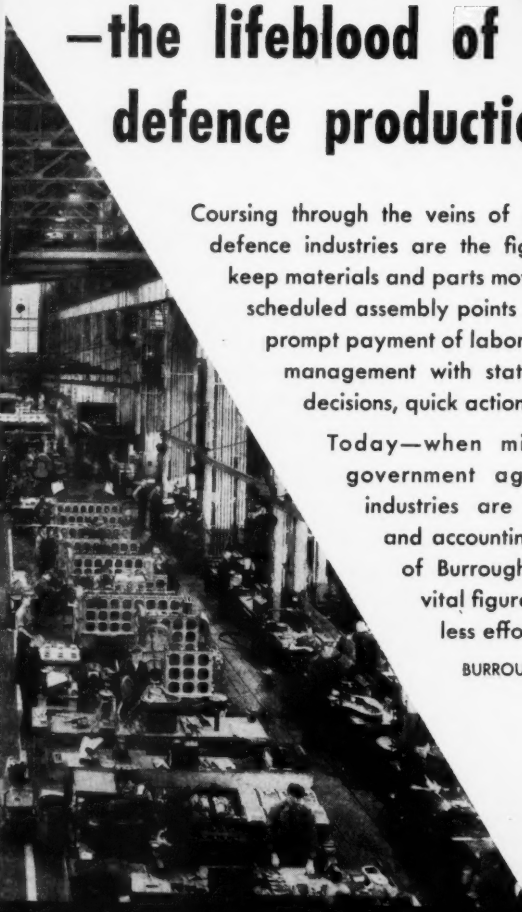

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